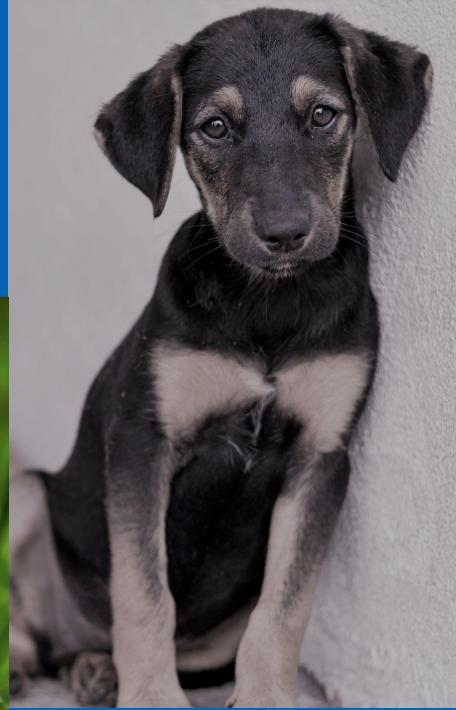


ANIMAL ADOPTION

HOW COULD WE IMPROVE ADOPTION RATE?

Classification Model & Recommender System

Yuwen Huang



MOTIVATION



Facts about U.S. Animal Shelters:

- **6.5 Million** companion animals enter U.S. animal shelters nationwide every year
- **1.5 Million** shelter animals are euthanized per year

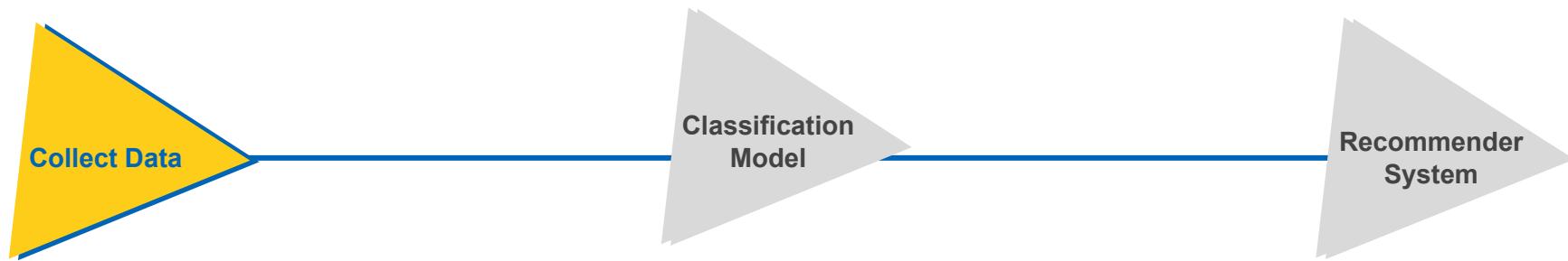
Goal:

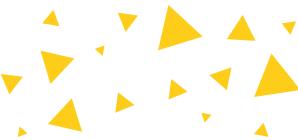
- Increase adoption rate
- Reduce the euthanasia rate of Impounded dogs and cats
- Showcase animals with higher risk of euthanasia to increase the chance they'll be adopted

WORKFLOW

Data:

- **Austin Animal Center**
(124,000 cases)
- **ASPCA** (21,000 images)





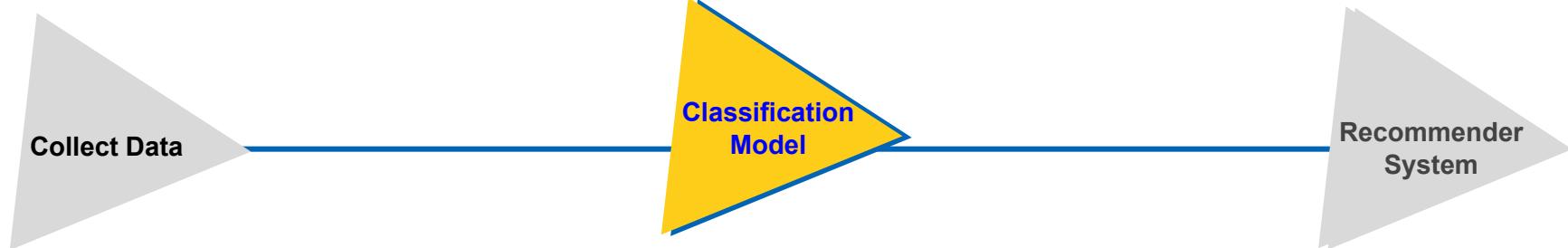
WORKFLOW



Data:

- Austin Animal Center (124,000 cases)
- ASPCA (21,000 images)

Predict whether an animal will
be adopted or euthanized



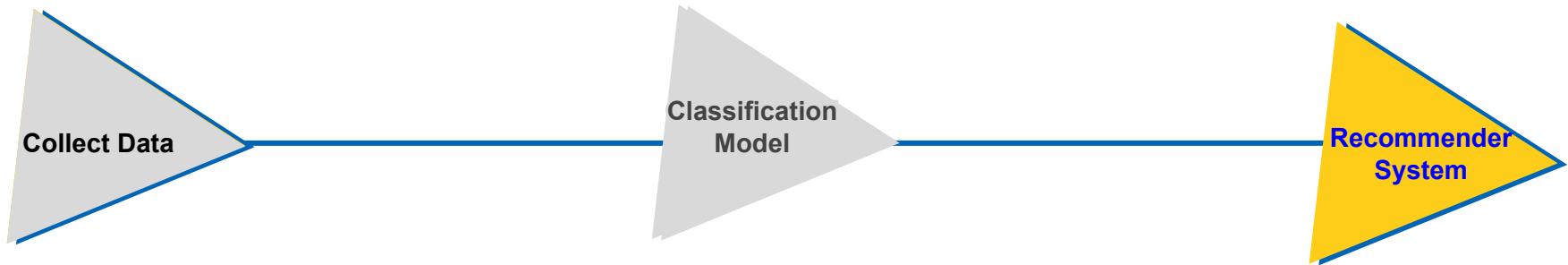
Features Variables:
• Animal Type
• Intake Condition
• Animal Profile Info



WORKFLOW

Data:

- Austin Animal Center (124,000 cases)
- ASPCA (21,000 images)



Features Variables:

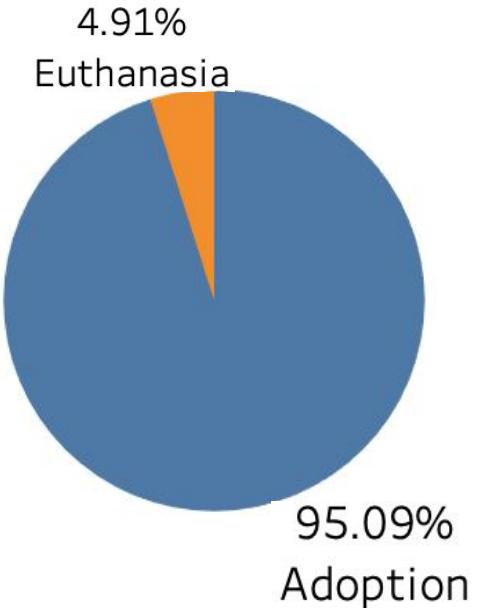
- Animal Type
- Intake Condition
- Animal Profile Info



ASPCA

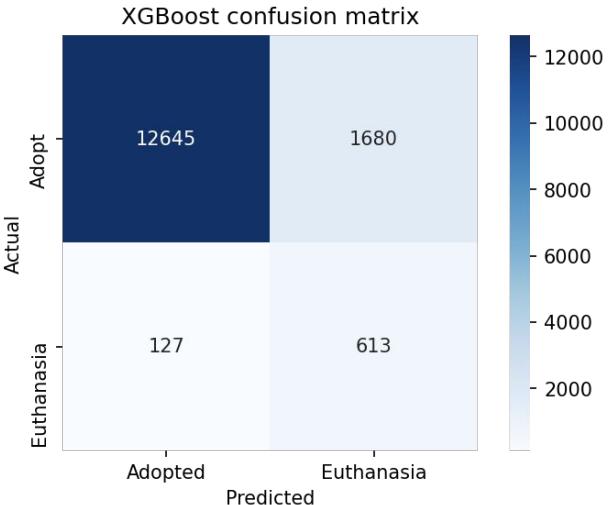
CLASSIFICATION MODEL- XGBOOST

Target Variable-Outcome

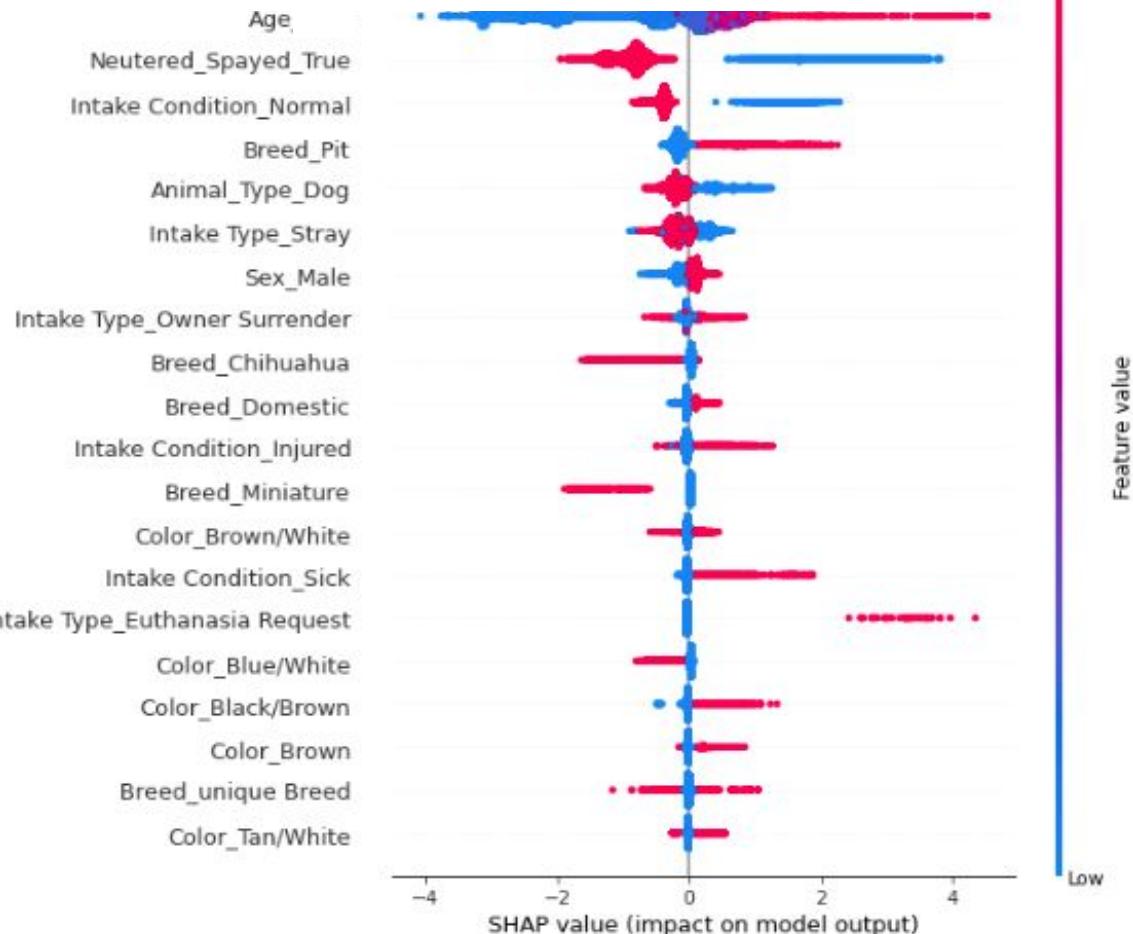


Final Model - XGBoost

- **Recall: 0.83**
- Precision: 0.27
- F1: 0.40
- ROC curve: 0.93
- Accuracy: 88%

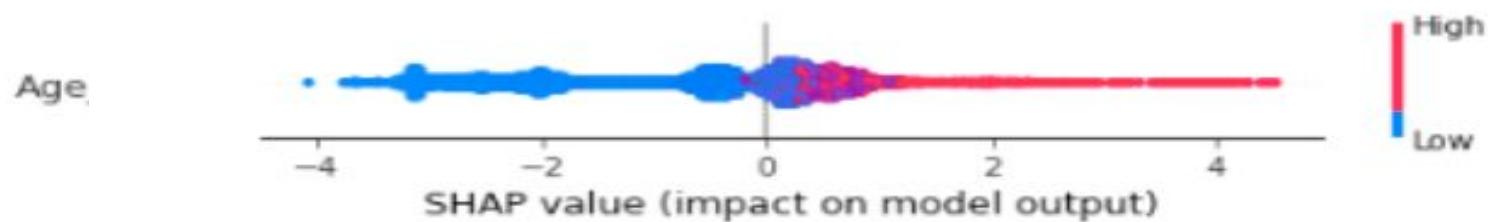


XGBOOST FEATURE IMPORTANCE



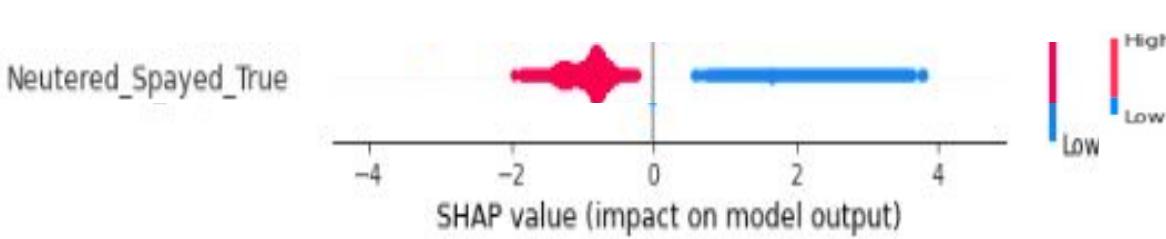
XGBOOST- INFLUENCE OF AGE

People tend to adopt younger animals.



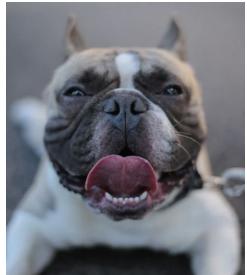
XGBOOST- INFLUENCE OF NEUTERED OR SPAYED

Neutered or spayed animals are more likely to get adopted

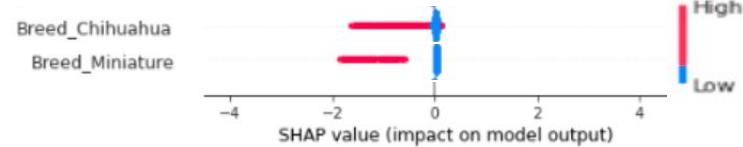
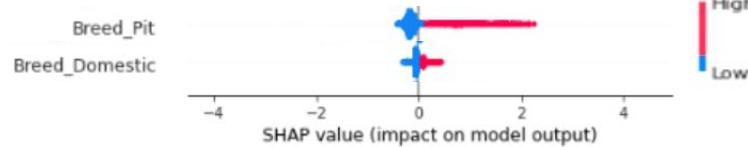


XGBOOST- INFLUENCE OF BREED

Pitbulls and domestic cats are less popular



Chihuahuas and miniature pets are more popular



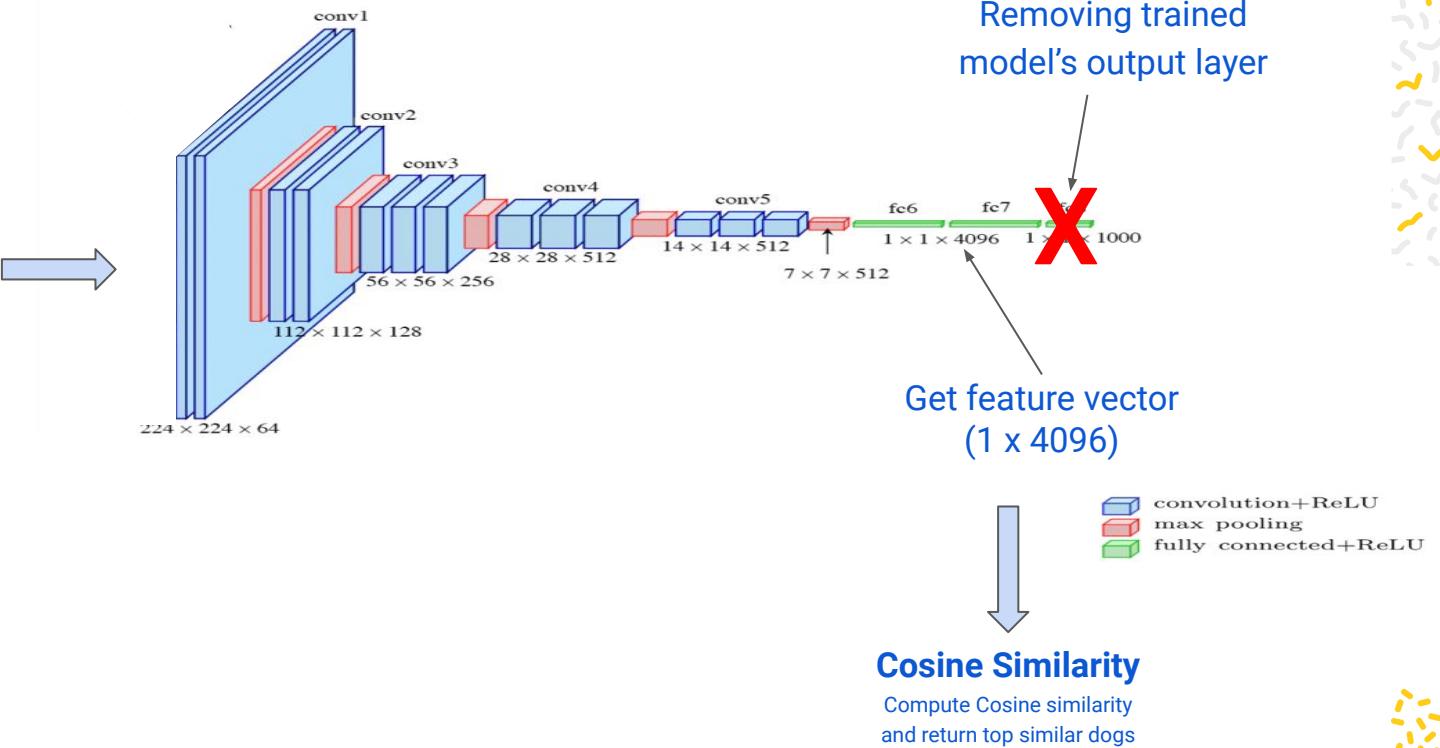
*Domestic cat: short hair mixed cat



RECOMMENDER SYSTEM

RECOMMENDER SYSTEM

Pre-train Model: VGG16

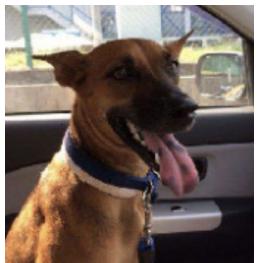




RECOMMENDER SYSTEM

Top 10 similar dogs

Input: Ideal dog



TOP 1



TOP 2



Top 6



Top 7



TOP 3



Top 4



Top 8



Top 9



Top 10

RECOMMENDER SYSTEM

Rerank the result- preferentially recommend older dogs

Top 10 similar dogs



Adult

Senior

Baby

Young

Adult

Young

Senior

Senior

Adult

1

2

3

4

5

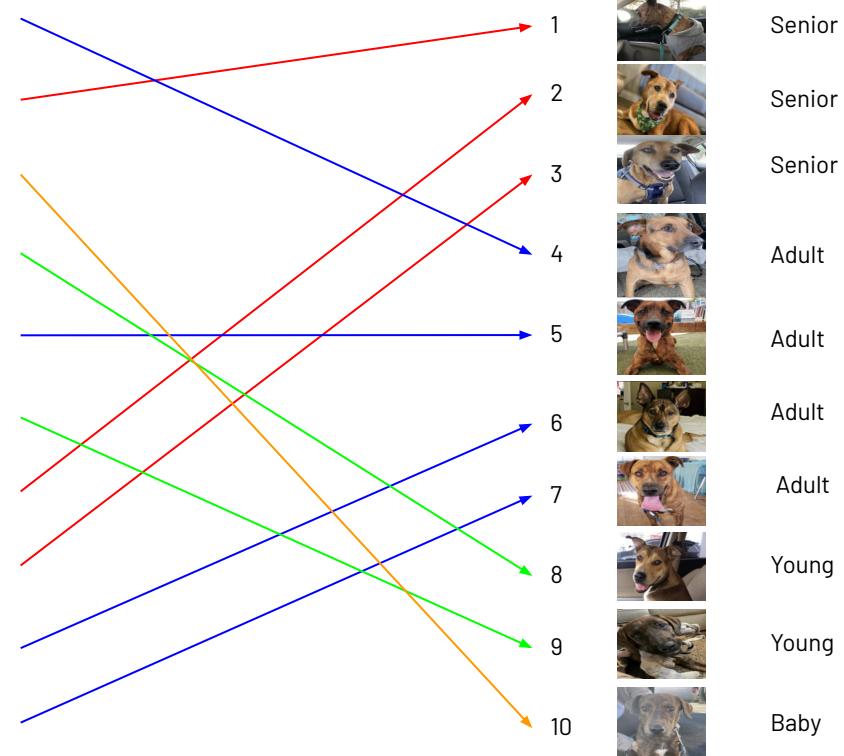
6

7

8

9

10



Input: Ideal dog

Conclusion

- Classification Model- XGBoost
 - Capture 83% of euthanized animals
- Which types of animals are less likely to be adopted?
 - Older dog/cat
 - Dogs and cats who are not spayed or neutered
 - The Breed:
 - Pitbulls
 - Domestic Cat
 - Large dogs/cats
- Recommender System for adoptable dog
 - Help potential pet owners save time to find their ideal dog.
 - Showcase older dogs in order to lower risk of euthanasia



THANK YOU !

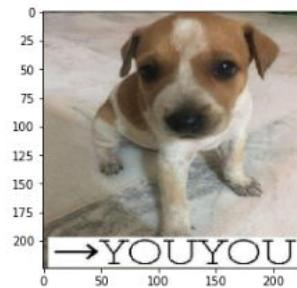
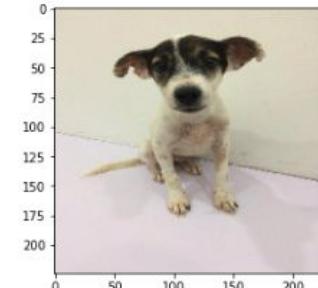
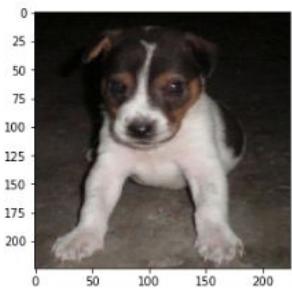
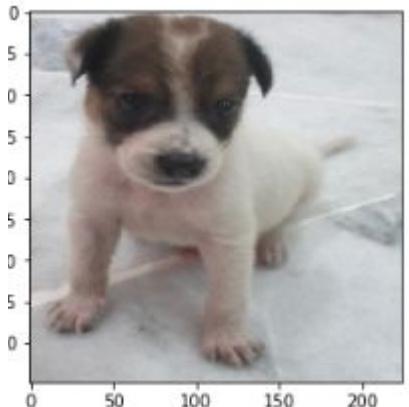
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[Slidesgo](#), including icons by [Flaticon](#), and
infographics & images by [Freepik](#)



APPENDIX

RECOMMENDER SYSTEM

Reorder the result- preferentially recommend older dogs



RECOMMENDER SYSTEM

Loading the image

21,000 adoptable dog images

Cosine Similarity

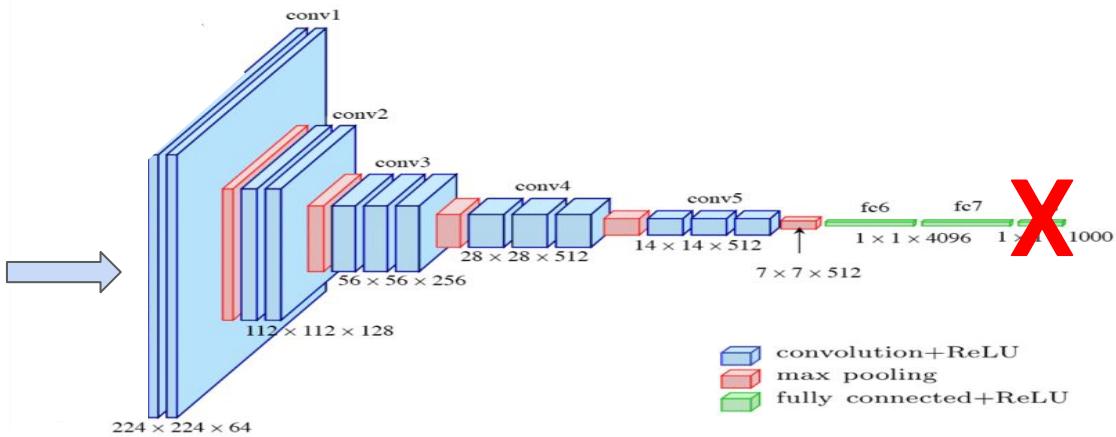
Compute Cosine similarity
and return top similar dogs

Pre-train Model:
VGG16

Removing trained model's
output layer

Get feature vector

Training and Testing data



RECOMMENDER SYSTEM

Pre-train Model: VGG16

Loading the image

- 19,199 images
- resize to 224 x 224

Removing trained model's output layer

Using pre-trained model
VGG16 output as feature
vector for input image

Get feature vector

Getting feature vectors for
training images from last layer
of VGG16

Compute Cosine similarity and return top similar dogs

ADOPT A PET

Adoptable Dogs in Your Local Shelter

Use the nationwide database of dogs looking for good homes below! Search by zip code to meet available dogs in your area. Please note, these dogs are from rescues and shelters nationwide and are not available through the ASPCA. If you live in New York City and are hoping to adopt from us, check out the dogs available at our [Adoption Center](#).

Breed Sex Distance of zip/postal code 90703

Qualities	Sizes	Ages	Good with...
<input type="checkbox"/> Needs a foster	<input type="checkbox"/> Small	<input type="checkbox"/> Baby	<input type="checkbox"/> Cats
<input type="checkbox"/> House trained	<input type="checkbox"/> Medium	<input type="checkbox"/> Young	<input type="checkbox"/> Dogs
<input type="checkbox"/> Declawed	<input type="checkbox"/> Large	<input type="checkbox"/> Adult	<input type="checkbox"/> Children
<input type="checkbox"/> Special needs	<input type="checkbox"/> X-Large	<input type="checkbox"/> Senior	

* Previous Page 21,283 pets found Next Page *



Candie
Bichon Frise / Mixed (medium coat)
Senior Female



PRINCE
Pit Bull Terrier (medium coat)
Senior Male
6 miles away



SOPHIE
Boxer / German Shepherd Dog / Mixed (medium coat)
Senior Female
6 miles away



ASPCA WEBSITE FOR WEB SCRAPING

Library:

- Beautiful soup
- Selenium

Scrape:

- Images
- Web Link

Total 21,283 Adoptable Dogs in US Shelter

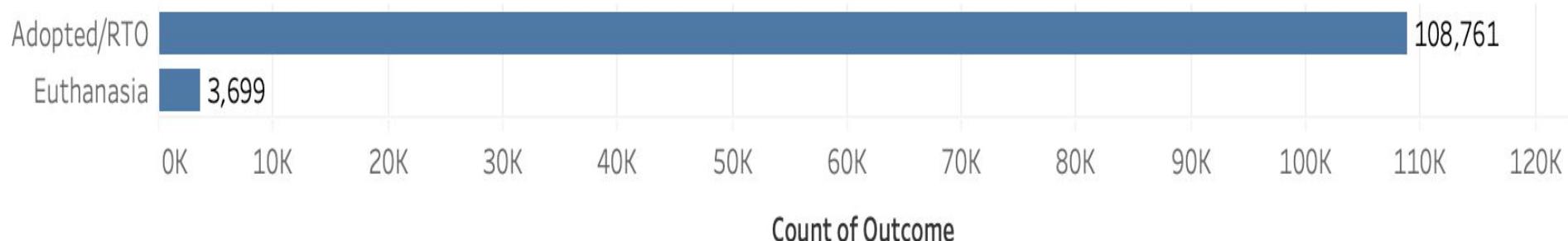
EDA- TARGET VARIABLE

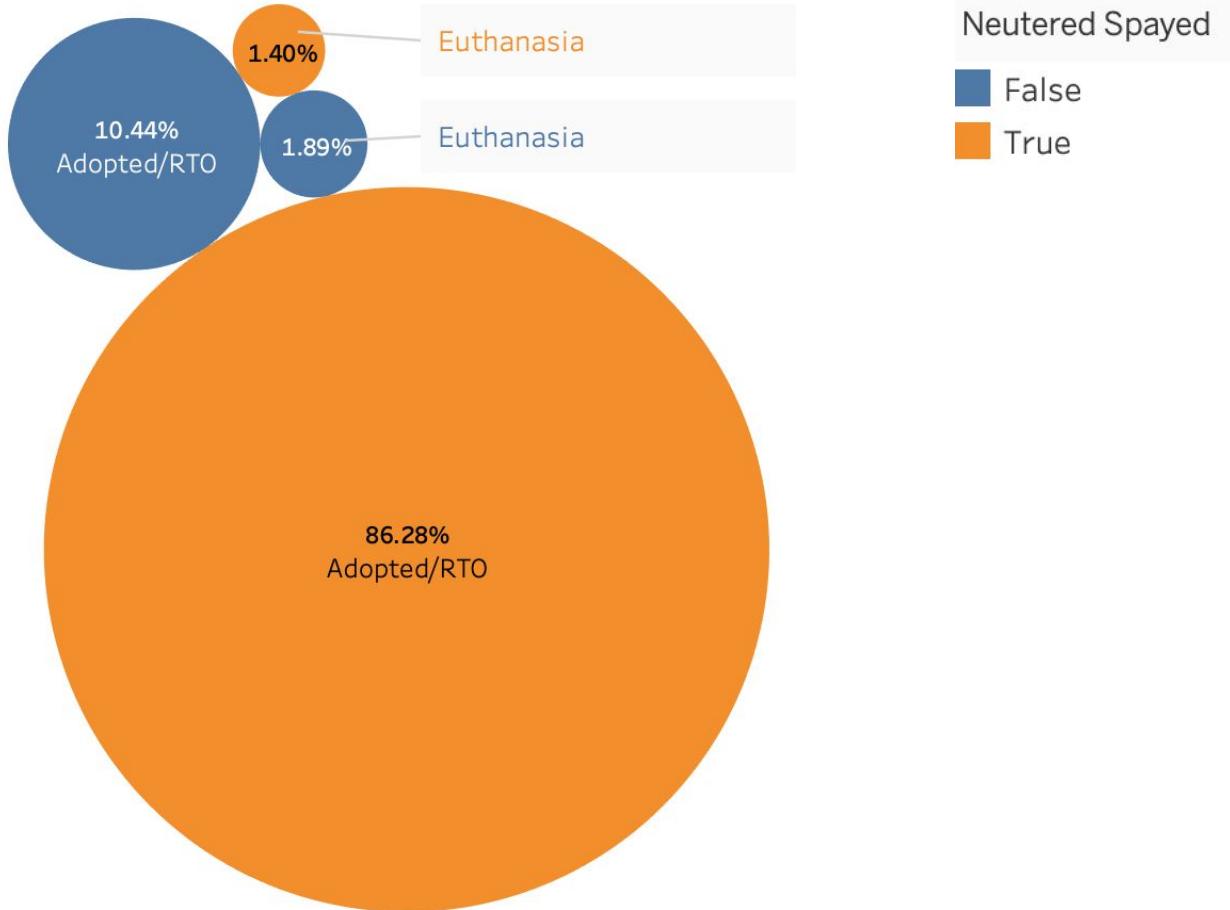
Target Variable-Outcome

- Class 1: Adopted or return to owner (RTO) ---> 97%
- Class 2: Euthanasia: need extra help -----> 3 %

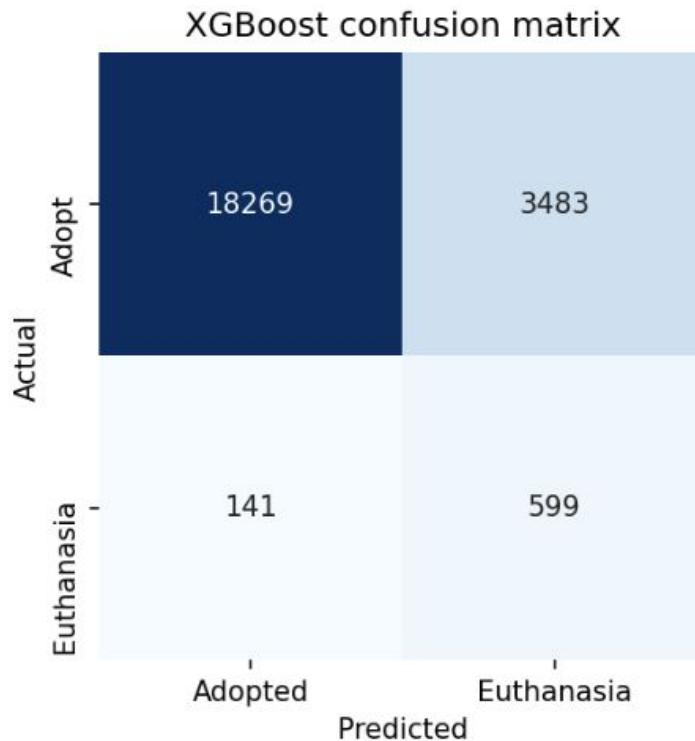
Handling imbalanced target label:

- Stratify = target variable
- Oversampling
- Undersampling





CLASSIFICATION MODEL - XGBOOST



Recall: 0.81
Precision: 0.15
ROC curve: 0.9084

